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EP 0191168 A1 WO 89/09042 A1 US 5838224 A
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(54) Abstract Title
Medication reminder device

(57) This invention concerns the design of apparatus to improve the compliance of patients with drug medication regimes. This is achieved through the use of trays (Fig3) of medication and coded instructions that are prepared by pharmacists. It also includes an electronic holder for these trays which performs timing functions and which allows and encourages the use of programmed reminders, the detection of if and when medication has been taken, and warnings if medication has been missed or if a wrong medication has been taken. In one version of the apparatus, the medication may be automatically dispensed at the appropriate time by the electronic release of a film sealing the contents of an individual compartment. LEDs 2 may light the appropriate compartment in a tray.

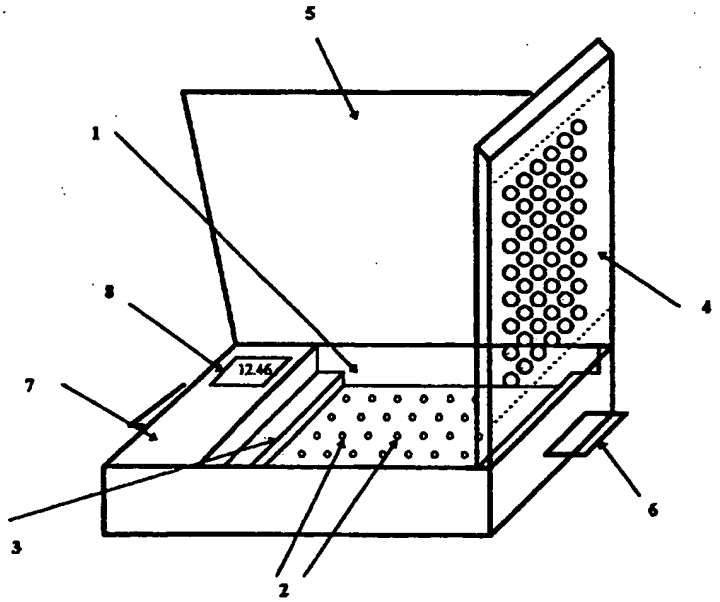

Figure 7: Electronic home unit to hold the medication tray

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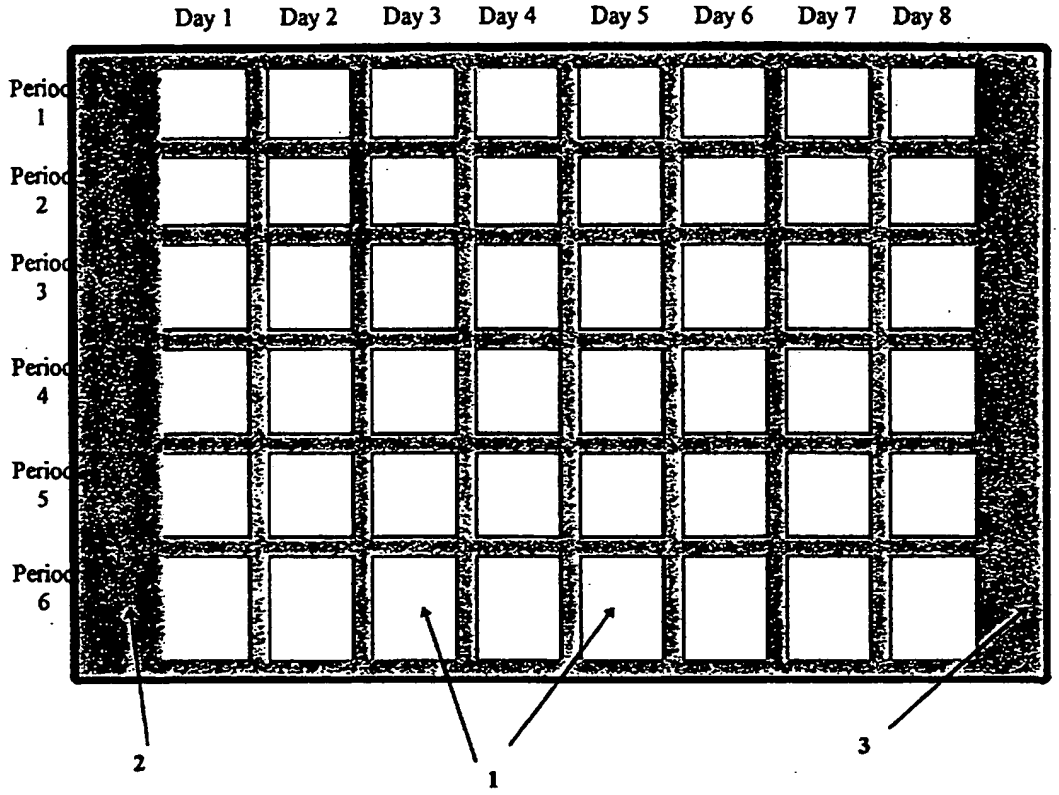

Figure 1: An empty drug tray viewed from above

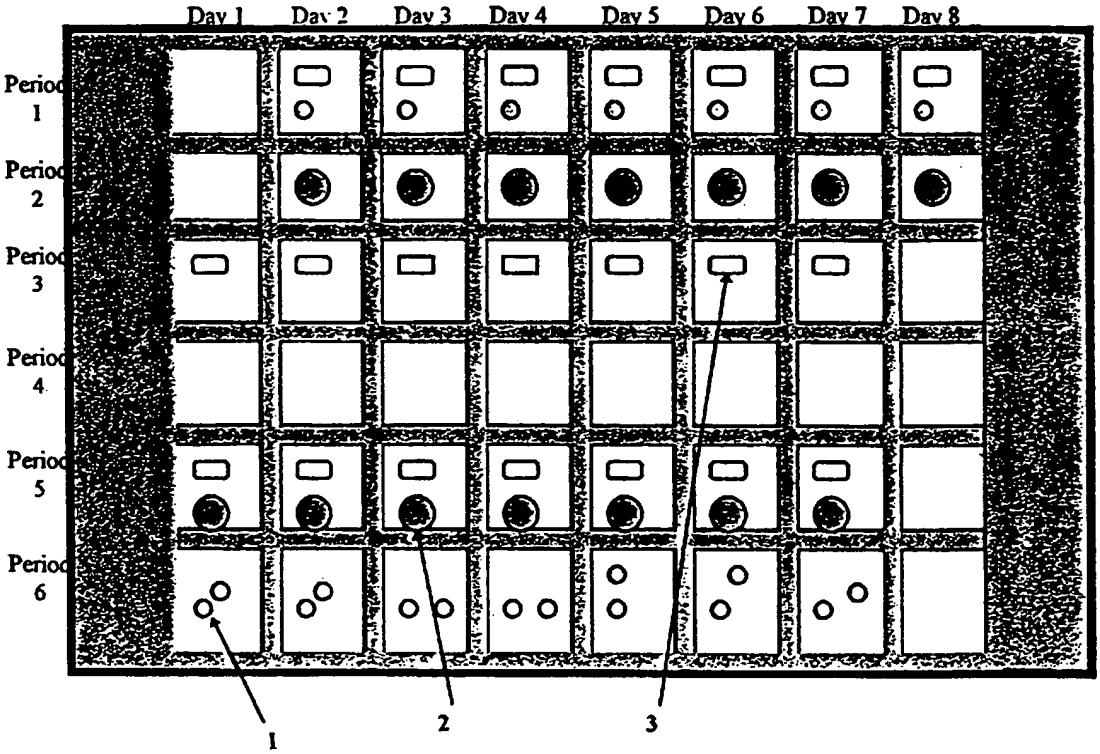

Figure 2: A drug tray viewed from above into which tablets have been dispensed

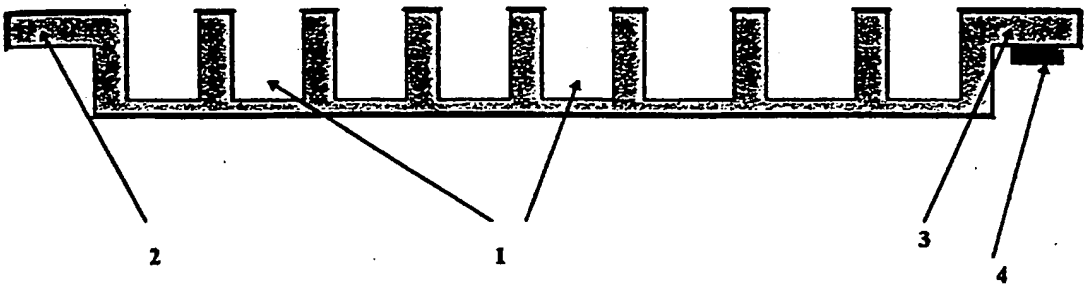

Figure 3: An empty drug tray viewed from the top side and showing the 8 columns representing a week.

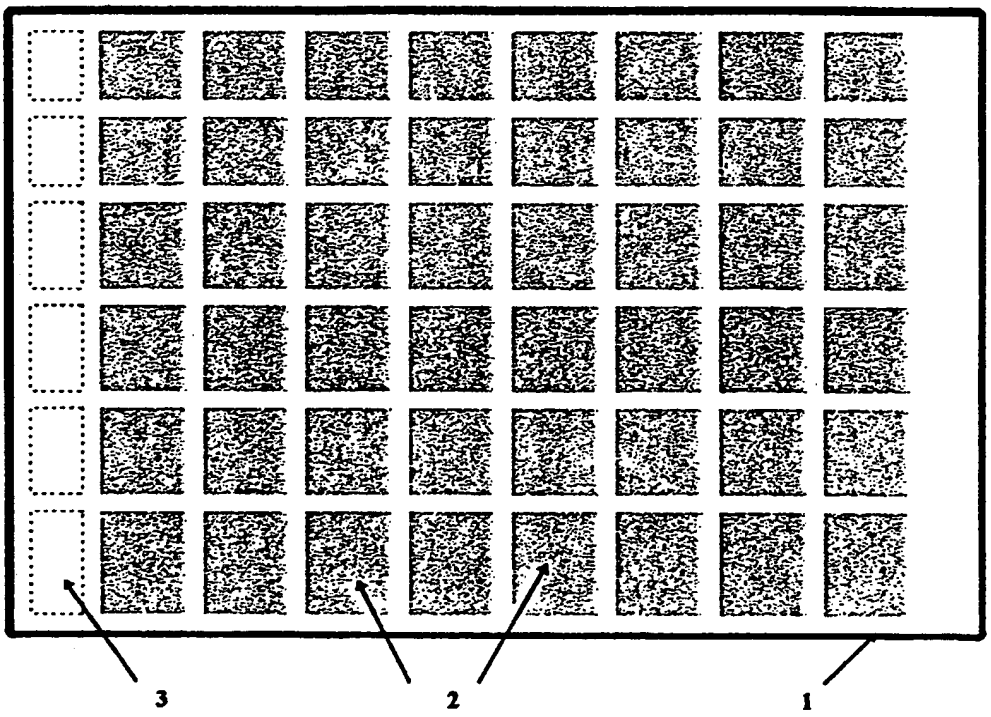

Figure 4: The thin sheet of plastic film which covers the tray viewed from above

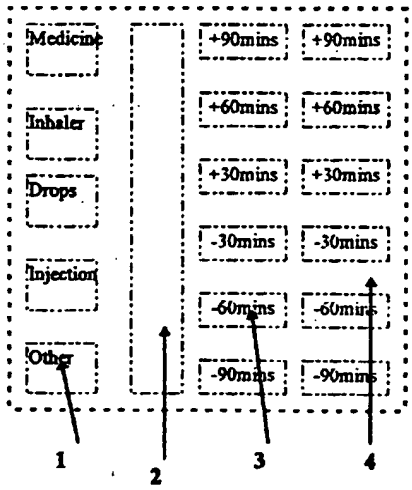

Figure 5: Left end section of film shown complete in Figure 4

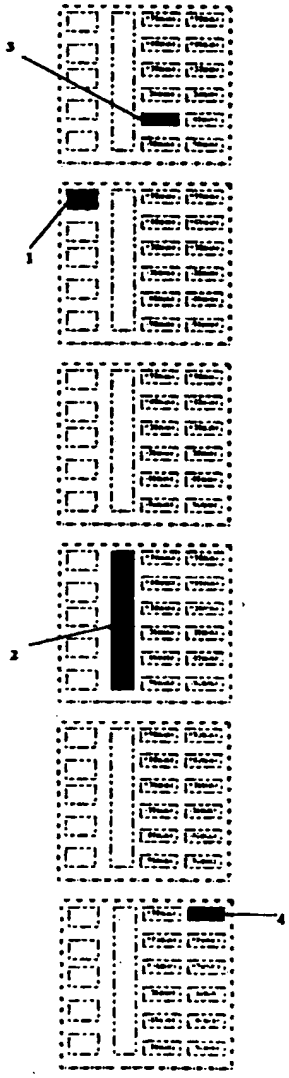

Figure 6: Example of coding

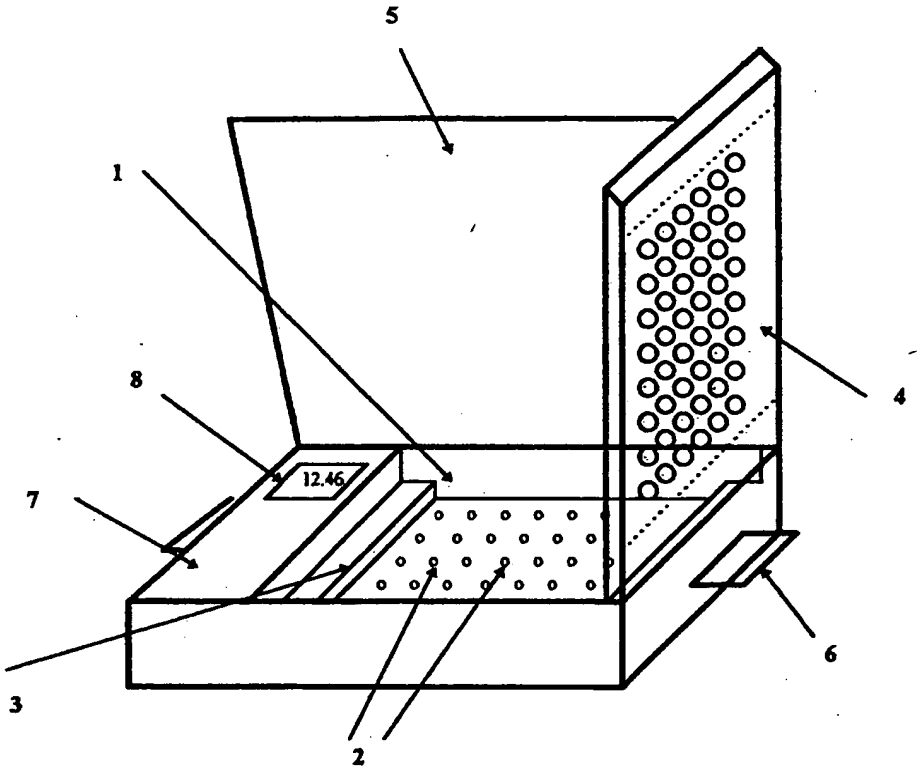

Figure 7: Electronic home unit to hold the medication tray

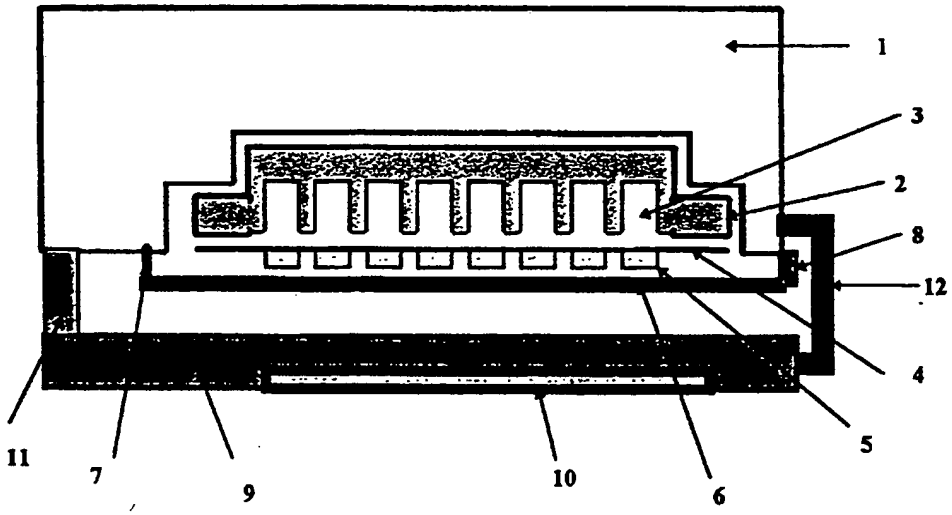

Figure 8: The upturned version of the dispensing unit

A METHOD AND APPARATUS FOR REMINDING PATIENTS TO TAKE MEDICATION AND TO IMPROVE COMPLIANCE WITH DRUG PRESCRIPTIONS.

Background to the Invention

Improvements in housing conditions, diet and health care have increased the longevity of people in the developed world. Many now develop illnesses associated with old age including diabetes, high blood pressure and dementia. The success of drugs in controlling many of these illnesses means that people can continue to enjoy full and independent lives in the community providing that they comply with their prescribed medications. Unfortunately, many older people suffer from a number of different chronic conditions each of which requires a separate type of medication. Consequently, significant numbers need to manage polypharmacies where they have to administer several drugs during the course of a day.

In an institutional care setting such as a hospital or nursing home, responsibility for taking the correct medication at the correct time lies with the medical and nursing staff. When the patient returns home, professional help is not generally available at the times when the drugs must be administered. There is therefore a risk that the medication may be forgotten, the wrong dose will be taken or that the wrong medication will be taken. These risks are especially relevant to older people whose cognitive abilities may be diminishing and those who are suffering from any degree of confusion.

It has been estimated that older people are likely to take between 4 and 6 different types of tablet every day in addition to other forms of medication such as medicines, inhalers and injections. Ensuring that they comply with prescription is an extremely difficult matter especially if they live alone as do typically 40% of people over the age of retirement.

A number of drug reminder or delivery devices have become available in recent years; these fall into three categories:

1. electronic reminder devices - these are generally small pill-boxes which can be programmed to ring an alarm when medication is due. They are useful for active people to use outside the home but need to be loaded with medication on a daily basis and have alarm times entered. They would also need several alarms and compartments in order to deal with polypharmacy. This facility in not available on commercial products.

2. telephone reminder systems - a patient's prescriptions are held on

a data-base at the service provider's premises. Patients are reminded about their medications either by telephone or using a pager. This service does not provide a means of checking that the medications have actually been taken.

3. pre-loaded drug trays - a day or a week's medication is put into separate compartments for each period of the day by a competent authority such as a pharmacist or a nurse. The patient opens the appropriate labelled compartments to remove the medication.

One of the most successful systems for application in both residential/residential home and community settings is the NOMAD systems as described by Niven in WO 92/0220. This uses a sheet of film to seal the tablets into the individual compartments and plastic sliders which can be used to shut off all compartments except the one from which tablets are due to be taken. This film is then pierced only over the compartment from which medication should be taken at that time. This arrangement may help to avoid confusion and may provide some feedback on compliance when the tray is collected and replaced. However, it does not provide a reminder of the need to take medication at a particular time, nor does it provide immediate warning if medication is missed, nor does it prevent the sliders being pushed incorrectly and the wrong dose being administered. This may be relevant both for the patient themselves or for other people who may enter the patient's home including small children.

The present invention refers to a method of storing and delivering medication whilst also providing timely reminders and warnings of non-compliance.

Description of the Invention.

The system includes a tray manufactured from a transparent, semi-transparent or translucent light-weight material such as a plastic. This tray has an array of compartments consisting of columns representing days and rows representing periods during a day. Each compartment, which could be rectangular, square, round, elliptical or any other suitable shape, would be large enough to contain the maximum number of tablets that might need to be taken at one time. It might measure as much as 30mm. wide by 30 mm. wide by 30mm. deep though the dimensions are not critical. The compartments are separated from adjoining rows and columns by typically 5mm. though, again, this dimension is not critical.

The number of columns would normally represent the period for which the tray would be prepared and might typically cover one week. In this case, there might be eight columns as the period to be covered might begin sometime during one day and might, consequently, finish at the same time on the eighth day. There

might be six medication intervals during the day, assuming that drugs are administered no more often than four hourly in a non-hospital environment. There would thus be 6 rows and 8 columns as shown in the diagram drawn in Figure 1 where a compartment is labelled 1, the area to one side of the compartments is labelled 2 and the area to the other side of the compartment is labelled 3. The time slots might therefore be:

Slot 1	-	Breakfast	-	7am. to 9.00am.
Slot 2	-	Morning	-	9.30am. to 11.30am.
Slot 3	-	Lunch	-	12 noon to 2pm.
Slot 4	-	Afternoon	-	2.30pm to 4.30pm
Slot 5	-	Evening meal	-	5pm to 7pm.
Slot 6	-	Bed-time	-	7.30pm to 9.30pm.

These are examples of how the day may be split up in order to allow medications to be delivered with meals or on a 4 hourly cycle The system has been designed to allow flexibility in setting up or adjusting these time intervals as described below.

The tray would be filled with a patient's medication as described in their patient file whether electronic or otherwise. The starting point will depend on what time of the day the trays would be renewed every week. The days of the week need not therefore be identified because trays would always start on Day I and would be completed on day 8. Figure 2 shows the medication in a typical tray when first delivered. It shows that the collection/replacement time in this example is after period 2 i.e. before lunch. Hence, the first tablets would be for period 3. Thus, there will only be 7 or the 8 compartments in any one row supplied with tablets.

In the example shown in Figure 2, capsules (labelled 3 in this figure) are to be taken 3 times a day, one before breakfast (period 1), one with lunch (period 3) and one with the evening meal (period 5) when one of the large round tablets (labelled 2 in this figure) is also to be taken. One of the large round tablets is also taken during the morning (period 2). One small round tablet (labelled 1 in Figure 2) is taken before or with breakfast and two last things at night. No medication is scheduled for period 4 (the afternoon) in this particular example. This example is relatively simple in the sense that there are only 3 different types of tablet to be taken but their different dose and time requirements makes administration difficult without the use of a reminder device.

Figure 3 shows the profile of a typical tray from the top i.e. looking at compartments for one week. In this figure, the compartments are labelled 1, the area to the left of the compartments is labelled 2 and that to the right is labelled 3. The length of the areas labelled 2 and 3 are arbitrary but are relevant both for the carrying of the tray and as vehicles for the storage of or reading of data. Labelled 4 in Figure 3 is a means of containing data in a non-volatile form. This could be simply the patient's name, address or number and that of the dispensing pharmacist and attending physician However, in our preferred form, the data would be included in the form of a code which could be computer-generated at the pharmacy and which could be in the form of a label or in an electronic form and contained on an integrated circuit, magnetic media or a smart card for example. In Figure 3, this coded information is labelled 4 and its location is under the area labelled 3. In practice, it might be on top, to the side or inside a slot in this section as the position is arbitrary providing that it can be accessed easily for reading.

In operation, the pharmacist or dispenser seals the tablets into the tray using a thin sheet of a plastic material which completely covers the tray and extends over each end as shown viewed from above in Figure 4. This film and its design are also relevant to the invention. A proprietary adhesive is first applied along all the contact upper edges of the tray in order to attach the film firmly on an individual compartment basis. In an alternative form, the film may be attached to the tray using a heat gun or arrangement of vacuum forming equipment. The material from which this sheet is fabricated is not critical provided that it can be furnished with electrodes either by use of a conductive ink or by the evaporation of some metal layer such as aluminium or by the spraying of some conductive material through a mask or by the attachment of some other conductive or contrasting medium on which a pattern may be established. The film material should also have a low absorption of water so that the film may not lose its sealing properties if moistened or if stored in a humid environment. It should also be safe if taken into the mouth in any form either in its natural form or when conducting electrodes have been applied or if oxidised in some way. In our preferred arrangement, this material should be a polymer such as low density polyethylene which can be formed in a sheet as thin as 10 microns by uniaxial or biaxial stretching and which also has a low relatively low melting temperature.

Figure 4 shows such a film, labelled 1, on which electrodes, labelled 2, have been provided selectively using an appropriate masking arrangement such that when the film is placed over the tray shown in Figure 1, the electrodes correspond to the compartments. The film corresponds to the size of the tray so that adhesion may occur over the greatest possible area. A series of patterns may be produced at one end of the sheet. These might correspond to each of the 6 time slots shown in our preferred or simplest arrangement. These are labelled 3 in Figure 4.

Figure 5 shows only the end section of the film drawn on the left in Figure 4 and for a single time period. The first pattern, labelled I typically might consist of five or more marks or defined areas where marks may be applied. These correspond to other types of medication that may be required to be taken during that time. For example, the first mark from the top may relate to a liquid medicine, the second mark to an inhaler, a third mark to drops and a fourth mark to an injection. Other marks may indicate other medical needs. In our preferred arrangement, these areas may be darkened by the pharmacist or dispenser who is preparing a patient's medication tray using an appropriate pen or by attaching an adhesive label over the appropriate area. However, a darkened area might alternatively be removed using scissors.

A second area, labelled 2 in Figure 5, is similarly defined for each time slot. In this case, its role is to define whether a time window will have any medication associated with it. Yet a third area defined for each time slot, labelled 3 in Figure 5, corresponds to the actual starting time for each slot and might also consist of a number of spaces where lines might be added, each one indicating deviation of that window from a default starting time. This might typically allow the starting time of a window to be moved by up to one and a half hours in steps of 30 minutes i.e. a total of 6 spaces. The fourth set of areas (labelled 4) is equivalent to the third but, in this case, represents a method of indicating changes in the end of a medication window. All these markings may be merged onto a single area using an appropriate coding scheme.

In operation, the pharmacist would consult with a patient's medication file while preparing the tray and would apply the set of marks as appropriate. In the majority of cases, default settings might apply and no marks may be needed. However, the marks effectively enable additional details of a patient's medication needs to be applied to the tray arrangement in a simple manner, both for the dispenser and for the machine to subsequently read and interpret. It follows that this information might be applied using any other coding scheme which might include bar-codes, electronic memory chips or other label-based methods which are machine-readable. In particular, it might involve any form of pattern that could be generated by the computer that is used to manage the preparation of the medication tray in the pharmacy.

Figure 6 shows an example of how additional data might have been applied to the film prepared for a patient who gets up early in the morning and retires late every night. This patient has no medication during the afternoon but has a spoonful of medicine during the morning. Consequently, there is a mark (labelled 1) in the first area defined in the second row of the day (medicine reminder), there is a mark (labelled 2) for the second area defined in the fourth row of the day (no medication during this time), there is a mark (labelled 3) on the third area (bring forward the first time slot by 1 hour) in the first row and one on the fourth area (put

back the final time slot by one and a half hours) on the last row of the day.

The medication tray with both tablets and coded information supplied by the pharmacist is then delivered to the home of the patient (whether in the community or in an institution) at the appropriate time every week. It may be apparent that similar but larger trays could be prepared for use on a two weekly or four weekly cycle.

In the patient's home, the new tray replaces the tray that has been in use for the previous week which should now be empty. The tray is held in an electronic home unit shown in Figure 7 which is a further component of this invention. This consists of a recessed section (labelled I) which is an electronic circuit board on which is mounted an array of light emitting diodes (LEDs) labelled 2. The tray may be fit exactly in this recess in such a way that each LED lies directly beneath each compartment. It also contains 2 electronic sensing sections (labelled 3) which lie beneath the side edges of the medication tray where information on the prescription and the patient are included respectively. It also has a hinged cover (labelled 4) which fits over the entire film including the medication tray whilst allowing access to the electroded areas of the film covering the medication through an array of holes where each hole corresponds to an individual compartment. These holes are approximately the same dimensions as the compartments which lie under them but may be of a different shape. For example, the holes in lid section may be round while the electroded areas are square. The entire electronic home unit may be fitted with a second hinged lid (labelled 5) which allows the unit to be locked when necessary. It is therefore provided with handles (labelled 6) to allow easy transport from one location to another and to allow the unit to be turned upside down in order to eject the pills and tablets. In one form of the device, this second lid may contain a sliding drawer unit or some removable section which can be pulled out to provide access to the medication. This drawer is fitted with a sensor arrangement which allows the operation of the drawer to be monitored electronically. Labelled 7 in Figure 7 is the electronic control and information section of the home unit. This contains the electronic processing circuitry, memory, power supplies and associated telecommunications interfaces and transmission modules. A display section labelled 8 is included. This would normally be a liquid crystal or light emitting diode unit which would indicate the time, the day and the date. It might also indicate messages including medication reminders either in alphanumeric form or by way of diagrams whether animated or otherwise. There might also be provision for an audio messaging interface such as a speaker or piezoelectric sounder.

The hinged cover of the home unit (labelled 3 in Figure 7) carries a printed circuit board on which are fabricated sets of contacts and connection tracks to each of the electroded areas on the film covering the medication compartments. These connections are returned via a flexible ribbon cable to the electronic processing

part of the home unit. When this hinged cover is closed down onto the film covering the medication, a sensor is activated. In the closed position a circuit is completed through each of the electroded areas corresponding to the individual medication compartments. It also applies downward pressure on the part of the Film and the medication tray which lie beyond the compartments. The electronic sensing elements beneath these areas are thus able to read the coded information using electro-optical principles, inductive, magnetic, electrostatic, electro-magnetic or capacitative coupling means or by some direct contact method.

In operation, the home unit keeps track of date and time which may or may not be displayed. When a new tray is inserted into the home unit, it may first test that all the necessary contacts have been made between the PCB carried in the lid and the conductive areas on the film. This may be achieved by ensuring that there is no high impedance path between any combination of the tracks which define the columns and the rows. A different set of contacts are provided on the PCB for each compartment's defined area and these may be addressed in turn but very quickly using multiplexing. It may next confirm that the patient details are correct by comparing the coded information stored on the medication tray with the details stored in its own memory. It reads prescription data encoded on the film sheet and loads it into its own memory.

The arrangement of light emitting diodes (labelled 2 in Figure 7) which are beneath the medication tray enables the unit to activate a light source for each medication compartment individually and at the appropriate time. Thus, when the time reaches the starting time for a particular medication window, it may cause the correct LED to be illuminated as an indication of which compartment should yield the medication at this time. The arrangements of electrodes on the film covering the medication will also enable the unit to monitor when the medication has been taken as it requires, in the simplest case, the film to be pierced to provide access to the pills. This act may break the low impedance circuit across this circuit and this change may be detected if all these circuits are continuously being read while the outer lid is open. Because the film is fabricated from a thin plastic material, the fingers may be used for this purpose. Alternatively, a sharp instrument such as a pair of scissors may be used for the same purpose. Indeed, in an alternative form of the invention, piercing of the film may be achieved with a dedicated wand whose presence within a compartment may be sensed with a small antenna or detector placed next to the source of illumination beneath the compartment. To remove the medication from the compartment in the tray, the unit is turned over using the handles provided and this causes the pills to drop out. The turning over of the unit is detected using appropriate sensors such as tilt switches.

In our preferred arrangement, the light source is the only means of showing a

patient which medication should be taken and the fact that a LED is illuminated may cause an external light source also to be illuminated. Both light sources would be extinguished when the medication has been taken. An audible warning may either replace or supplement the visible sign. It is likely that an audible warning might only be necessary as the end of the medication window approaches and the correct medication has not been taken. However, for blind or visually handicapped people, audible or vibrating warnings may be necessary at the start of the time window and the form of the signal might be modulated or changed in either intensity or frequency as time progresses.

It follows that the system which detects that the film seal has been broken for the appropriate medication compartment can also monitor the integrity of the film over other compartments. Thus, if an attempt is made to take the wrong medication by piercing the film over any compartment other than the one that is relevant at that time or on that day, this may be detected by a change in the impedance of the appropriate electrode path which may provide a trigger for an alarm message or advice. The system is therefore capable of both reminding the patient which medication is due but also of ensuring compliance by monitoring any deviations from the prescribed medication regime. This ensures that the system can be used with confidence both by older people who may be confused or suffering from mild dementia as well as those psychiatric patients who are able to live in the community provided that they are able to administer medication regularly and without deviation from the prescribed dose.

The response of the system to compliance failure can be flexible. In the first instance, it may simply provide messages and instructions on what to do next. This information can be programmed into the intelligent processing unit before it is issued. In our preferred arrangement, any compliance failures produce a coded warning which may be transmitted either through the mains wiring, or through dedicated wiring or by r.f. telemetry to a receiver and decoder unit which may be in the same dwelling or in neighbouring premises. This might allow an instant response from a warden in a sheltered housing complex or from staff in an institutional setting. In our preferred arrangement for community care, the warning signal may be received by an emergency alarm telephone which transmits the warning data to a control centre using the public telephone network. Here, it may be received by staff who may speak to the patient to provide reminders or advice or, if the patient does not answer the telephone for example, summon help. The response centre might also notify a paging service who could relay reminder information. It follows that if the medication system is linked to an integrated telecare system either by radio or by direct wire contact, then the programming or reprogramming of the device may be performed remotely using the telephone interface and a telemedicine control centre.

There may be many older or physically handicapped patients who are unable to

perform the set of movements necessary to obtain their medication however simple they may be. In another embodiment of this invention, their needs may be addressed by operating the home unit in an upturned manner as shown in Figure 8. In this figure, the body of the home unit is labelled 1, the medication tray is labelled 2, the individual compartments for medication are labelled 3, the sealing film is labelled 4, the electrodes on this film are labelled 5, the lid which provides contacts to these electrodes is labelled 6, the closing mechanism for this lid is labelled 7, the hinge is labelled 8, a second lid is labelled 9, the removable and censored drawer in this outer lid is labelled 10, the locking mechanism on the outer lid is labelled 11 and the hinge on the outer unit is labelled 12. This arrangement may require the dispensing pharmacist to overlay the pills with a spacing material so that they do not lie directly against the plastic sealing film during storage. In our preferred version, the tray differs from that described above by having a removable base. In this version, the plastic sealing film is applied before the tablets are loaded by the pharmacist. The tablets are placed into plastic cups which are then loaded into the compartments before the compartment bases are reinserted. The result is that the entire cup falls out of the compartment when the seal is broken. It follows that when using cups of this type, liquid medications might also be used directly with the system; this might require several sub-compartments to be organised for each medication window. Indeed, each dose of medication may be sealed into separate addressable compartments using a plastic film and may be released as appropriate by the electronic controller. The need for the array of rows and columns representing times and days may be eliminated.

An additional feature of this arrangement is the ability of the system to automatically break the correct seal at the appropriate time and without the need for electromechanical relays, solenoids or any moving parts. The automatic breaking of the seal is achieved by passing current through the electrodes which have previously been used to confirm the integrity of the seal. The electrodes on the film have an impedance of about 10 ohms compared with perhaps 1 or 2 ohms for the contact and connection arrangements. Thus, if a potential of 12 volts was applied across the circuit, a current of 1 Ampere would flow. This causes Joule heating with a power dissipation of the current squared multiplied by the impedance. The 10 Watts of heat produced on the surface of the electroded plastic film will cause the film to melt in a time rather less than one second because of the thin nature of the film and its relatively low melting point. Furthermore, because of the biaxial stretching process employed in the fabrication of thin plastic sheets, the effect of melting will be to force the melting plastic away from the centre of the electroded region leaving a hole in the film through which the medication will drop into the collection tray whether in a separate container or not. It may thus be collected by the patient without any need for intervention and without the need for moving parts which may become worn or defective. An alternative method of achieving the melting phenomenon will be

to employ a conductive or semi-conductive sealing layer and using bulk conduction to achieve the same heating effect as is achieved using electrode heating. This approach may require the use of an a.c. signal where the frequency of the current source coincides with the dielectric loss peak of the material in question.

It follows that the technique described above may also be relevant in forms of vending machine where items may be displayed and subsequently released by using electric current to weaken or melt a film of plastic which seals the items into respective compartments The technique could be extended to allow materials separated by such films to be mixed or to react together under electronic control by removing the separating films as required. The preferential melting and removal of sealing films of the type described above might similarly be performed using an infra-red heating source such as a laser diode or a light emitting diode.

Claims

1) A system for the storage of doses of medication in a form which encourages compliance with prescription consisting of at least some of the following elements:

a medication tray containing an array of compartments in which 8 or more columns represent the days of a week and up to 6 rows represent medication periods during that day and containing two other areas where a card, label or electronic components have been attached and on which the identity of the patient has been recorded in a non-volatile but machine-readable form,

a thin sheet of plastic which seals the medication into the compartments in the medication tray whilst providing a set of electronic contacts which permit the integrity of the seal to be verified and on which is drawn or recorded a code or series of codes which provides details of other medication types and the times when they should be administered,

an electronic box with built-in intelligence, clock and calendar functions, sensors and memory into which the medication tray is held and by which relevant data is read,

an array of light emitting diodes which can be addressed to illuminate a single compartment of the medication tray,

a hinged lid which provides contacts to each of the electroded areas on the film and a downward pressure on coded areas which enable the data to be read reliably by the electronic box,

a decision processor which interprets the actions of the patient in terms of the programmed medication prescriptions and facilities suitable reminders and interactions,

an alarm interface which enables reminders to be issued either when medication is due or if medication has not been taken at the appropriate time,

a display which may provide time and calendar information and/or other information of relevance to the patient, and

an outer lid which may be locked or which may serve to collect tablets when used in an upturned position

2) A system as described in 1) in which medication, patient identification information and prescription information be provided by a trained pharmacist.

3) A system as described in 1) which may be used by patients in their own homes or within institutions.

4) A system as described in 1) in which the correct medication compartment is indicated by a source of illumination beneath the compartment.

5) A system as described in 1) in which the thin film of plastic which seals medication into individual compartments may be applied using plastic adhesive or by selective heat treatment.

6) A system as described in 1) in which patient identification may be attached to a medication tray in a coded form which can be read by an electronic control unit.

7) A system as described in 1) in which a patient's prescription details may be applied by a pharmacist using a computer generated label.

8) A system as described in 1) in which a patient's prescription details may be applied by a pharmacist using a pen or a cutting instrument.

9) A system as described in 1) in which no compartment is illuminated when no tablets need to be taken.

10) A system as described in 1) where time and date are displayed by the intelligent home electronics unit.

11) A system as described in 1) where failure to break the correct seal can be detected automatically.

12) A system as described in 1) in which breaking the incorrect seal can be detected automatically.

13) A system as described in 1) in which a seal may be broken with an instrument whose presence within a compartment may be detected electronically.

14) A system as described in 1) in which the presence of a finger within a compartment may be detected electronically.

15) A system as described in 1) in which alarm messages may be generated if a patient fails to comply with a prescription.

16) A system as described in 1) in which reminders to take forms of medication other than pills and tablets may be generated.

17) A system as described in 1) in which an alphanumeric display may be used to indicate time and date and to display reminder messages.

18) A system as described in 1) in which an audible alarm may be generated to remind a patient to take medication or to signal a failure to comply with a prescription.

19) A system as described in l) in which the alarm interface may provide a radio signal to an appropriate carer in the event of non-compliance with prescription.

20) A system as described in 1) which may be compatible with a community alarm telephone and which may send alarm coded alarm signals to a control centre.

21) A system as described in l) which may cause a remote carer of community alarm operator to issue reminders by telephone or using a pager device.

22) A system as described in 1) in which tablets may be reached by breaking the seal over the relevant compartment using an electronic wand device.

23) A system as described in 1) in which tablets may be removed from the medication tray by turning it over using the handles provided.

24) A system as described in 1) in which the removal of medication may be confirmed using an electronic sensor to detect the turning over of the medication tray.

25) A system as described in 1) in which the electrodes supplied over the medication compartments on the sealing film may be used to produce a low impedance path.

26) A system as described in 1) in which selective application of a potential difference across an individual electrode over a medication compartment may cause a current to flow across such an electrode.

27) A system as described in 1) in which a high current may be forced to flow for a short time to produce a heating effect in that electrode which would cause the sudden melting of that section of the film.

28) A system as described in 1) in which access to the pills in a particular compartment may be achieved without physical contact using an electrical current.

29) A system as described in 1) in which dielectric heating of the sealing film

may be employed in order to release the medication contained in an individual or individual containers.

30) A system as described in 1) in which the medication assembly may be stored in an upturned manner.

31) A system as described in 1) in which medication may be automatically released by selective application of current through an electroded area.

32) A system as described in 1) in which the confirmation of compliance may be recorded using sensors on the drawer of the outer lid.

33) A system as described in 1) in which small children may not tamper with medication without detection.

34) A system as described in I) which may control and verify the compliance of patients with a drug therapy.

35) A system as described in 1) which may become a relevant component in an integrated telecare system

36) A system as described in 1) in which the programming or reprogramming of the medication prescriptions may be performed remotely using the telephone or a similar telecommunications interface.

37) A system as described in any of the previous claims where each tablet is sealed into a separate compartment by an electroded film and is released at the appropriate time using electrically current flow.

38) Any device for storing items where their subsequent release is controlled by the selective melting of an electroded area of thin plastic film using electric current to provide the heat.

39) A method of selecting items for use in vending machines where transparent plastic films may be released under electronic control by melting electroded areas using electric current.

40) A method of accessing individual compartments that have been sealed using a plastic film where the selective melting of the film is achieved using an infra-red source of radiation.

The Patent Office

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Application No: GB 9825661.3 **Examiner:** Ross Cavill
Claims searched: 1-37 **Date of search:** 27 May 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G3T (TS1,TS2)

Int Cl (Ed.6): A61J 7/04

Other: Online:WPI,EPODOC,JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP0191168 A1	(SIMONIZ) whole document	1 at least
X	WO89/09042 A1	(COMPUMED) whole document	1 at least
A	US 5838224	(ANDREWS) note compartment illumination	
X	US 4717042	(PYXIS) whole document	1 at least
X	US 4617557	(NAT PATENT) whole document	1 at least
X	US 4616316	(US ADMINISTRATOR) whole document	1 at least

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Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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